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SSD OPERATIONS MANUAL

QUICK OPERATIONS GUIDE:

1) If you see the GUI on Figure 1 please proceed to step 2, If not then do:

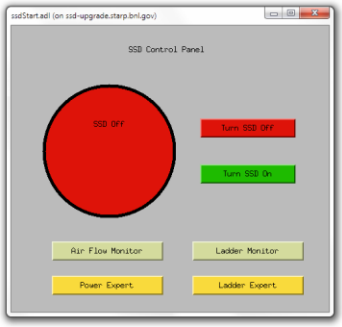


Figure 1. Main SSD GUI

   a. Open a MobaXterm terminal
   b. Ssh USER@ssd-upgrade.starp.bnl.gov [key+pw]
   c. Cd /home/ssd/
   d. ./ssdTop

2) Click on Ladder Monitor where you should see Figure 2. This window contains information about 4 temperature sensors in the Ladder cards, number of events taken (HOLDS) and status of the 16 hybrids per ladder in the right, where yellow is ON and red OFF. Notice that when the LC is not configured this values are not correct.

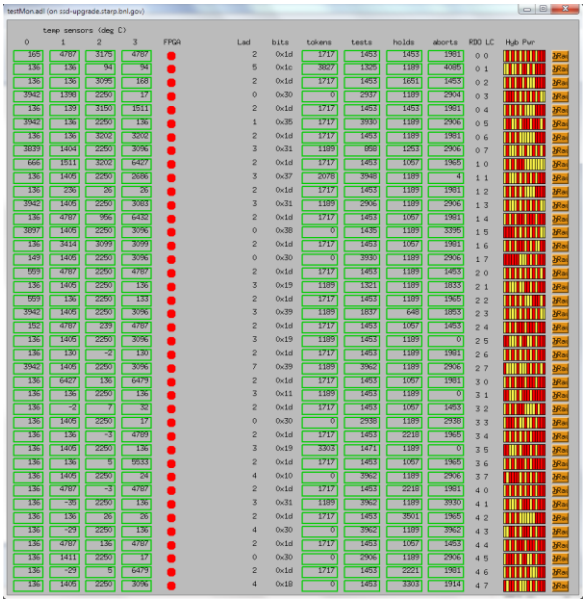
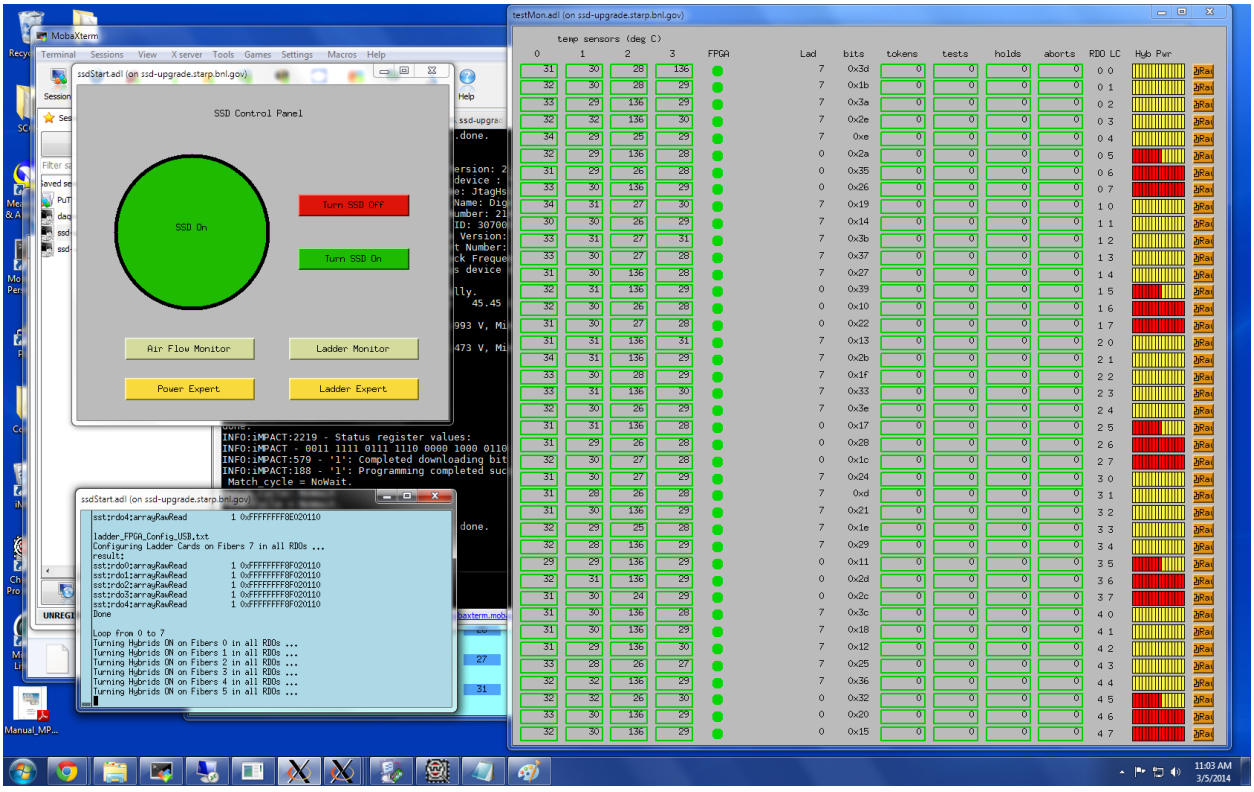


Figure 2. Ladder Monitoring

3) Click on Turn SSD ON and watch the progress, the terminal window in the lower left shows the messages of the running processes, and the monitoring screen shows how to Hybrids are being turn ON in a sequence. The Circular indicator should be green, if not then please go to step 4.



4) Checking Power supplies
   a. Click on Power Expert button and Figure 3 will appear
   b. Open each module in the two right columns and see which modules are still OFF, the power supplies work as groups, so checking one 2V module, one 5V and one HV should be enough to identify the problem.
   c. Click on the All On/ All Off button on the left
   d. Click the corresponding ON button and watch the Circle main indicator
   e. If this didn't help bringing them all ON, click on Clr Events (trip) and re-try.
   f. Hit the Turn SSD on button again to reconfigure the system if some 2V or 5V was off

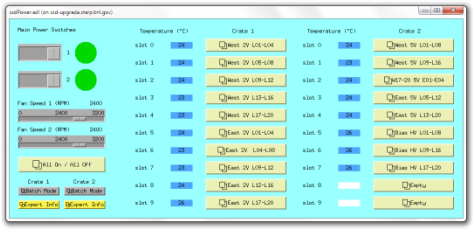


Figure 3. Power Expert

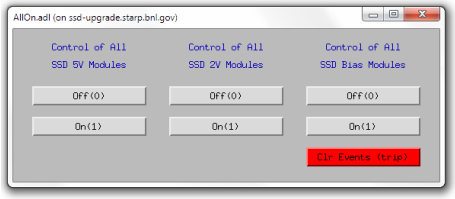


Figure 4. All on / All off

5) The system should be ready for data taking.

SLOW CONTROLS OPERATIONS GUIDE

The Slow Controls are built on top of EPICS soft IOC and MEDM GUIs to display controls and monitoring information. The IOC should be running at all times. The latest version of this file can be found in: http://www-eng.lbl.gov/~leardila-perez/SSD/Documentation.pdf or .docx

1) Attaching to the softIOC console when it is running already:

In the ssd-sc-slowc.dhcp.lbl.gov or ssd-upgrade.starp.bnl.gov machine type:

a) cd /usr/local/epics/ioc/siocftdi/
b) sh -x attach

At this point you should be able to see the terminal messages of the IOC and cancel it if you want by typing the "exit" command or de-attach from it by typing Ctrl + A + D.

Sometimes there are screens created by accident, to get rid of them do;

c) screen -RR name
d) Then, to kill it type: Ctrl + A + Shift k

2) Starting the softIOC:

When the IOC is not running you can clearly identify it because the monitoring windows are all white with no variables behind their controls and displays. To run it do:

a) cd /usr/local/epics/ioc/siocftdi/
b) sh -x run

3) List files used and what to edit

Inside the following folder in the SLOWC machine are all the .sh files that invoke the pyton script to send the .txt files to the FTDI module.
The sh scripts live in:
cd /usr/local/epics/ioc/siocftdi/head/opi/

and the text files live in:
cd /usr/local/epics/ioc/siocftdi/head/scripts/cmd

You can run the expert GUI by doing:
cd /usr/local/epics/ioc/siocftdi/head/opi/
sh runMedm.sh ladder_expert.adl

Or individually call the scripts, but keep in mind that the scripts are going to still read which RDO and Fiber Channel is selected from the GUI, to change this just open the .sh script and scroll down to the part where those values are obtained and hard wire the desired values.

4) List of scripts used

- **runMedm.sh:** use this script to open the ladder_expert.adl GUI as instructed in numeral 3). Then use the EPICS window to open testMon.adl to open the monitoring screen.
- **LadderCard_FPGA_Config.sh:** Use this script to configure ladder cards. The script reads the parameters from the Expert GUI to know where to send the command (RDO and Fiber-Channel numbers). The script takes ladder_FPGA_Config_USB.txt and sends it to the selected channel.

ladder_FPGA_Config_USB.txt is prepared using RBF2USB.exe and the .rbf configuration file as parameter.

- **TurnHybridsON.sh:** Use this script to turn ON the Hybrids in a sequence. The script reads the parameters from the Expert GUI to know where to send the command (RDO and Fiber-Channel numbers).
- **TurnHybridsOFF.sh:** Use this script to turn ON the Hybrids in a sequence with 0.2 s delay between hybrids. The script reads the parameters from the Expert GUI to know where to send the command (RDO and Fiber-Channel numbers).
- **Alice128_Config.sh:** Use this script to configure the Alice Chips in the mode selected in the ladder_expert.adl GUI in the field Operation mode. The script reads the parameters from the Expert GUI to know where to send the command (RDO and Fiber-Channel numbers).
- **LC_TestTrigger.sh:** Use this script to send USB triggers to selected RDO channel. The script reads the parameter from the Expert GUI to know where to send the command (RDO number).
- **Load_DAQ_Config.sh:** Use this script to send DAQ parameters to selected RDO channel. The script reads the parameter from the Expert GUI to know where to send the command (RDO number). This script sets values for: LC_Trigger_Delay, TCD_ENABLE, DATA_FORMAT, ZERO SUPRESSION. Check TCD_DAQ.txt and USB_DAQ.txt Also these two files should be typed in the text input of the ladder_expert.adl GUI.
- **STATUSCHECK.sh:** Type this script from the command line and get in return the STATUS Registers for RDO and Fiber-Channels Selected.
- **STATUSCNT.sh:** Type this script from the command line and get in return TCD trigger info, RHIC Strobe number, Number of Holds and Test issued.
- **CalLVDS.sh:** Type this script from the command line and start the calibration sequence for the LVDS link between the RDO selected and its L2F board.

5) how to generate a ladder card FPGA program file from the Altera file

We need the .rbf file from the altera software, and then there is a C++ code called RBF2USB inside the svn/ssd/software/RBF2USB folder. To run just type in a terminal:

a) ./RBF2USB.exe file.rbf

It should generate an output like this: “file_USB.txt” that should be the configuration file to send over the RDOs to the LC.

To change which file to send type in ssd-upgrade:
a) cp file_USB.txt /usr/local/epics/ioc/siocftdi/head/scripts/cmd
b) cd /usr/local/epics/ioc/siocftdi/head/opi/
c) vi LadderCard_FPGA_Config.sh
d) Modify the line ~20 that says “file=oldfile_USB.txt” to be “file=file_USB.txt”

6) Changing the RDO number by changing the FTDI serial number associated with it:

Let’s say I just plugged a new RDO and I don't know the serial number. How do I do to determine that new FTDI serial number and replace the corresponding file?

If the SOIC is stopped we can display all FTDI number connected by doing this:
a) cd /usr/local/epics/ioc/siocftdi/head/showFTDIinfo
b) ./showFTDIinfo

Or, we can do:
a) /sbin/lsusb -v | grep iSerial

To change the FTDI number associated with an RDO number, do the following and replace the desired file.

a) cd /usr/local/epics/ioc/siocftdi/head/iocBoot/siocftdi
b) cat st.cmd.ftdi0 (edit the file, here just display)

```
################################################################################
# Startup commands for FTDI 0
epicsEnvSet("FTDI_SERNO_0", "$(FTDI_SERNO_0=FTWFM548A)");
ftdiConfigure("R0", "$(FTDI_SERNO_0)")
dbLoadRecords("db/ftdi.db", "P=$(P),R=0")
```

NOTE: each FTDI module has A and B side, and the serial number that should be change is just the first values that are selected. The A should remain at the end.

7) Adding a PV name to the IOC, from ssd-upgrade do:

a) Stop the IOC as described in 1)
b) cd /usr/local/epics/ioc/siocftdi/head/ftdiApp/Db/
c) modify the PV file that you are interested in, for example: vi ftdiVar.db (this file contains the PVs displayed in the Ladder Card Expert window)
d) Include the new PV name, type, and options desired, save the file.
e) cd /usr/local/epics/ioc/siocftdi/head/
f) make
g) run the IOC as described in 2)

8) Operating the detector Expert mode: starting from ssd-upgrade or ssd-sc-slowc

a) cd ~ssd/
b) ./ssdTop
c) Check vacuum system is ON (details in 9)
d) Make sure wiener Power supply and 9U VME crates are ON (details in 10)
e) Configure RDO and L2F boards with new firmware if necessary (details in 11)
f) Start softioc if not running (details in 12)
g) turn power ON to desired Ladder Cards (LC) by navigating the Power Expert GUI
h) Open Ladder Expert GUI
i) configure LC FPGAs by clicking on LC Config FPGA (select desired RDO and Fiber channel, also select which LC_FPGA version you want to use: v0E is the latest LC from Christope, ADC is the fake ADC where each hybrid will produce ADC(H)=H*64+16; 0 <= H <= 15)
j) Turn Hybrids ON
k) select the desired Alice Configuration to use according to Table 1. Select the correct operation mode and if Pulses selected type the proper pulse amplitude and Pulser file. Finally Click on Alice Config. To modify the configuration files do: in ssd-upgrade go to: /usr/local/epics/ioc/siocftdi/head/scripts/cmd/AliceConfX.txt wit X being one of the numbers in the table.

Parameter	Def (0)	1	2	3
I LVDS	20	20	20	20
I OutputBuff	100	100	100	100
I InputBuff	50	50	50	50
V Shaper	91	100	120	140
I Shaper	60	40	40	40
V Preamp	153	153	153	153
I Preamp	100	100	100	100
Observed Shaping time	1.9 us			2.8 us

Table 1. Alice Configuration parameters, Values in Decimal, Use HEX when changing the files.

You can also add more file names but to link them to the selector you have to add more options to the corresponding PV name.

l) Type "TCD_DAQ.txt" below Configure DAQ button and then click it for all RDOs

m) Detector should be ready to take triggers from the TCD trigger system of STAR and deliver the data to the DAQ computers.
n) If you want to modify the TCD_DAQ.txt file please go to /usr/local/epics/ioc/siocftdi/head/scripts/cmd
o) Start the run either with the run control, local run or rorc tools (details in 13)
p) Check run log (details in 14)
q) Analyze run files with independent reader (details in 17)

9) Checking the Vacuum system status

From the main ssdTop GUI, click on the Air Flow Monitor button and observe that Air flow = ~3.5, Alarm Limit = ~1.5 and Temperature < 30 C, it usually remains ~25 C. This is the temperature at the Vacuum system

10) Checking WIENER and 9u VME crates

a) Checking 9U VME crates, where the RDOs and L2F live.
From any starp computer (ssd-upgrade works) do:

i) ssh -YA sysuser@sc5.starp.bnl.gov [pw]
ii) vme_plat1

If it does not work then do

iii) cd /home/sysuser/GUI/vme
iv) medm -displayFont alias vme_1st_plat.ald&

v) Check that the crate 97 (SSD) is ON and fan speed is 3120 rpms

b) Checking WIENER power supplies
i) From the main ssdTop window click on the Power expert button
ii) You should see the status of the two crates, its fan speed, Temperature in C for each module and if you click on each module the status of individual channels, its voltage and current.

11) Configuring RDOs and L2F FPGAs and PROMs from the command line

To load the RDOs and L2F there are some scripts to help in this process by using the impact Batch mode. There are scripts to load the BIT files and MCS files separated for each board. As an example to load the BIT file, using a terminal in the Windows computer at the control room (TPCGAS-152690) do:
a) cd ~ssd/
b) ./RDO_Config_BIT.sh -v 0030 -s 1 -b 2

v=version
s=sector
b=board

The option -v is mandatory and should have a parameter with the version number, the BIT file should be place in the Desktop folder called “ConfFiles” and should be named in the following form “RDO_XXXX.bit” being XXXX the version number in hex

The option -s is more important than -b and if it is present -b is ignored.
-s has two parameters 1 and 2. It correlates to the two computers taking data in the DAQ side (sst01 and sst02) sector 1 is the three first RDOs, sector 2 is the second last RDOs

c) Creating PROM file from bit file:
(1) Open impact by doing: START -> All Programs -> Xilinx Design Tools -> Lat Tolls 14.5 -> iMPACT
(2) Select create PROM file
(3) For RDO select BPI single FPGA > virtex 6 > xcf128x [16M]
For L2F select Xilinx Flash/PROM > Platform Flash > xcf32p [32M]
(4) Click on add storage device
(5) Select output directory and file name in the form “RDO_XXXX.mcs”

(6) Right click on the screen and select generate file
(7) Save file in the "ConfFiles" in the desktop

d) Checking what version of FPGA Firmware is loaded inside the RDOs, in ssd-upgrade do:
i) cd /usr/local/epics/ioc/siocftdi/head/opi
ii) sh CheckFPGA.sh

12) Start the IOC if not running
i) ssh ssd@ssd-upgrade or sysuser@softioc3
ii) cd /usr/local/epics/ioc/siocftdi/
iii) sh -x run

13) start the run
a) Run control: in this mode the detector is included to run along with other detectors, or just by itself, but the run is started, configured and executed by the main run control computer inside the control room. It can be requested by the phone and the shift crew operator should be in capacity of executing it as needed. DAQ log is available following 14). The output file is .daq and can be found in HPSS (high performance storage system), to retrieve the information from HPSS follow 15).
i) include the ssd detector in the run control
ii) select the proper run configuration type
iii) select the desired number of events
iv) select the desired frequency (only in TCD_ONLY runs)
v) click the "Start Run…" button
vi) watch the progress on the http://online.star.bnl.gov/daq/export/daq/ web page

b) Local run: in this mode the detector can be run independently from the main run control, we have full control over the parameters but the run is limited to only one sector. It is common to have both sectors configure to receive triggers for which you could expect the buffers to get full due to events being stored in RDO buffers but not pull out to DAQ. To fix this, just do i) to vi) in the ssd DAQ computer that you weren't intending to take data. DAQ log is available following 14). The type of output file is .sfs with DAQ format but without trigger tables.
i) Configure the sector that is **NOT** being used with "USB_DAQ.txt" then hit the "Configure DAQ" button.
ii) Configure the sector that **IS** being used with "TCD_DAQ.txt" then hit the "Configure DAQ" button
iii) log to operator@daqman.starp.bnl.gov [pw]
iv) ssh sst01 or sst02 depending on which sector you want to use [pw]
v) /RTS/bin/TPX64/start_local_daq.sh -D sst -H 100 -s 5000 -t 3

D=detector
H=Frequency in Hz
S=samples (number of events)
t=type -t 1 is pedestal (-t 3 is physics)

To stop the run, close all files, generate pedestals (if "-t 1"), etc.
Once the events are taken (look at the DAQ Monitoring) type:

vi) /RTS/bin/TPX64/start_local_daq.sh -D sst

c) RORC tools: This type of run log is not available and the output files are plain ASCII txt files.
i) ./RTScache/ssd/rorc/rorc_receive0 -r 0 -x 0 -m 0 -c 0 -K -u 128 -o 0 /RTScache/data/filename.txt

r=reset level
x=
m=PCIx board number
c=channel
k=file name
u=phys memory size (don't include this option to do default zise)
o= starting point

14) Checking the DAQ run log

a) log to operator@daqman.starp.bnl.gov [pw]
b) tail -f /log/det.log | grep sst

15) Retrieving run files from HPSS

a) Find the runs that you are interested in by going to http://online.star.bnl.gov/ and searching in the RunLog Browser or the Electronic ShiftLog.
b) Visit http://www.star.bnl.gov/devcgi/FO/genlist.cgi [pw]
c) Type the desired DAQ file(s) name(s) into the third box (ei: 15070121), note the selected path in box one as this is going to be the location of your file inside the star shared network drives.
d) Click in the "submit" button
e) Copy the output line(s) and paste them inside a .txt file inside the start-network-drives (ei: /star/institutions/lbl/USERNAME/list.txt) or upload the list.txt file from starp by doing: scp list.txt USERNAME@rftpexp.rhic.bnl.gov:/star/institutions/lbl/USERNAME/
f) To submit the order of moving the files log into the star-shared-network-drives by following 18)c) then type: hpss_user.pl -f list.txt
g) Your file should appear in the destination directory showed in step 15)c)

16) Moving files

Sometimes you need to manually move files across the different machines, to do so, here are some examples:

a) To RSSH (shared-network-drives): from any computer with your private key install do:
   i) scp file.txt USERNAME@rftpexp.rhic.bnl.gov:/star/institutions/lbl/USERNAME
b) from daqman to ssd-upgrade:
   i) cp file.txt /net/ssd-upgrade/data/
c) pulling file from daqman to ssd-upgrade
   i) scp operator@daqman.starp.bnl.gov:/net/sst01/RTScache/data/file.sfs .

17) Checking the runs with independent ssd_reader

a) Use independent reader
   i) Log to star-network-drives described in 18)c)
   ii) cd /star/institutions/lbl/leardila
   iii) ssd_decoder filename.daq
b) generate independent plot
   i) cd /star/institutions/lbl/leardila
   ii) gnuplot fiberToPlot.txt

   The way the reader is working at the moment (March 12, 2014) is checking every single event for the fiber length and the tokens in the data at the right positions; if it does not find it then it will start printing each one of the words of the event that it found to be wrong. It is also checking event number 3175, 3176 and 3177 and will print each single line of those events.
   The reason for this is because at some point I wanted to do verify something in those events.

   You can always start a new reader from scratch following Tonko's RTS_example.c inside

c) To edit and recompile
   i) Change the ssd_decoder.cc file as desired
   ii) sh Rts_Example.sh ssd_decoder.cc
   iii) compile should go without errors and now you can use ssd_decoder as in step a)

18) Logging to machines starting outside of BNL

a) RCF
   i) ssh username@rssh.rhic.bnl.gov [key+pw]
b) starp
   i) from RCF
   ii) ssh stargw.starp.bnl.gov

```
c)  star-network-drive
    i)  From RCF
    ii) rterm -i
d)  ssd-upgrade
    i)  from starp
    ii) ssh ssd@ssd-upgrade.starp.bnl.gov
e)  daqman
    i)  from starp
    ii) ssh operator@daqman.starp.bnl.gov                [pw]
f)  sst0x
    i)  from daqman
    ii) ssh sst01  or sst02                              [pw]
g)  Berkeley slowc
    i)  ssh username@ssd-sc-slowc.dhcp.lbl.gov           [pw]
h)  sc5 wiener crate #97
    i)  from starp
    ii) ssh sysuser@sc5.starp.bnl.gov                    [pw]
```